Technical Report 1039

Environmental Intensity, Stress, and Training

Ross C. Teague and Ok-Choon Park
U.S. Army Research Institute

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EDGAR M. JOHNSON
Director

Technical review by

Richard Maisano
Joel M. Savell

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14. ABSTRACT *(Maximum 200 words):*

Stress and its effects on task performance and on human physical and mental well-being have received a great amount of attention. The majority of the efforts directed at reducing the negative effects of stress have either been after-the-fact treatments of individuals exposed to stress or "time out" methods that include relaxation and communication techniques. While these have been shown to be useful techniques, their effectiveness is limited. Certain tasks do not allow for "time out" exercises, and only treating individuals after the fact does not remove the negative effects of stress on performance. There is a need, then, for preparing individuals to perform in environments in which stress and its effects can negatively influence performance and the task that does not allow for "time out" exercises. This paper discusses methods for training individuals for performance in an intense environment.

Phased-intensity and graduated-intensity training are discussed in detail. Phased-intensity training allows the trainees to practice the basic skills without any level of intensity present and then to experience the intensity level that the trainee will encounter in the actual task performance situation. Graduated-intensity training presents intensity throughout training with a gradual increase as training continues. This review points out the flexibility and ease with which intensity of the training environment can be presented using simulators.

15. SUBJECT TERMS

Intensity	Simulator training	Graduated-intensity training
Stress	Environmental intensity	Phased-intensity training

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Ross C. Teague and Ok-Choon Park
U.S. Army Research Institute

Advanced Training Methods Research Unit
Robert J. Seidel, Chief

Personnel Performance
and Training

FOREWORD

The Advanced Training Methods Research Unit of the U.S. Army Research Institute for the Behavioral and Social Sciences performs research in the field of advanced training methods, including the application of emerging technologies. A major focus is to enhance soldiers' task performance through improved training that can be achieved with the advance of theoretical knowledge and the application of training methods and technologies.

This report examines the literature on situational intensity, mental workload, task performance, stress, and stress reduction techniques. The purpose of this report is to (a) examine the relationship between situational intensity and task performance, and (b) discuss the training methods for preparing individuals to successfully perform a task in an intense and potentially stressful situation. After reviewing the literature on task intensity, mental workload, stress, and preventive stress management techniques, two specific training methods are described: (1) phased-intensity, and (2) graduated-intensity. These methods are viewed as useful primary strategies in preventive stress management. Due to the flexibility and ease of manipulating training situations, including the intensity levels, computer-controlled simulations are recommended for future research and training that requires the consideration of situational intensity. This line of research will enhance the training capabilities of the U.S. Army.

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ZITA M. SIMUTIS
Deputy Director
(Science and Technology)

EDGAR M. JOHNSON
Director

ACKNOWLEDGMENTS

EXECUTIVE SUMMARY

Research Requirement:

As part of a research program investigating the preparation of individuals and teams for performance in an intense environment, this review examined the literature on stress, intensity, mental workload, and stress reduction techniques.

Procedure:

This paper is based on a wide range of literature obtained from a review of the ERIC, Psych Info, Management Contents, and ABI INFORM databases. Military examples and other related literature were used whenever possible. The relation of environmental intensity to stress and mental workload was reviewed. Particular attention was directed toward discussing the techniques for preparing individuals to perform in an intense, potentially stressful environment.

Findings:

Preventive stress management training seeks to alter the effects that stress can have on individual well-being and performance. The goal of preventive stress management techniques is to begin the intervention in the early stages before stress can result in negative effects. Primary prevention strategies seek to alter the stressor itself by redesigning the task or individual. Secondary strategies attempt to alter the response to stress once it occurs. While these secondary strategies can be useful, they have a limited impact and take place after the negative effects of stress have begun. Therefore, it would be useful to utilize training strategies that will prepare individuals for performance in environments in which stress can negatively effect performance and in which the nature of the task does not allow for redesign or secondary strategies.

Overall, the literature showed that individuals who will be required to perform in an intense, potentially stressful environment need to (1) develop the basic skills necessary to perform up to some criterion in the performance setting, and (2) have practiced against the criterion-level intensity prior to being place in the performance setting. Two techniques that were shown to be particularly useful in meeting the two requirements for this type of training were phased-intensity and graduated-intensity training.

Phased-intensity training allows trainees to practice the basic skills without any level of intensity present and then presents criterion-level intensity for the trainee to practice with. Graduated-intensity training presents intensity throughout training; however, early in training, the intensity level is very low and as training continues, the level of intensity increases to criterion-level intensity. Both of these training types are primary prevention strategies, useful for reducing the effects of stressful environments on individual performance and well-being.

This review also pointed out that simulators would be ideal administrators of these phased- and graduated-intensity training techniques. The flexibility and ease with which all aspects

of the training environment can be manipulated make simulators potentially very useful for exposing individuals to varying levels of intensity.

Utilization of Findings:

This paper provides a review of the literature in the areas of stress, intensity, mental workload, and stress reduction techniques, which will be useful for further research in these areas and will enhance the training capabilities of the U.S. Army.

ENVIRONMENTAL INTENSITY, STRESS, AND TRAINING

CONTENTS

Environmental Intensity, Stress, and Training

        Traditionally, workplace and combat stress have been dealt with in a variety of ways. Most of the efforts aimed at reducing the negative effects of stress on human health and job performance have used "after-the-fact" methods (Quick and Quick, 1984; Eysenck, 1988). These strategies are based on treating "stress casualties" through mental and physical healthcare following exposure to a stressful environment (Nelson, Quick, and Quick, 1989). While this after-care is important, it would be better for individuals and organizations if persons were better able to handle performing in the stressful situation without ending up as casualties to stress.

        Preventive stress management techniques are based on the premise that it is not inevitable that stress and intense environments must result in deleterious effects on the individual as well as his/her performance. The goal of preventive stress management techniques is to begin the intervention in the early stages before stress can negatively influence performance and the well-being of the individual. Primary intervention strategies seek to alter the stressor itself by redesigning the task or environment, or changing expectations about performance. Secondary intervention strategies attempt to alter the responses to stress once it occurs (Nelson, Quick, and Quick, 1989). These secondary strategies have, for the most part, focused on the training of "time out" methods that include exercise, relaxation, breathing, and communication techniques. While these can have an important place in the fight against stress and its negative effects, they have limited impact. Certain tasks allow for only minimal or no "time out" exercises, and merely treating individuals after-the-fact does not remove the negative effects of stress on performance. There is a need, then, for primary intervention techniques that will prepare individuals for performance in environments in which stress can negatively affect performance and in which the nature of the task does not allow for redesign or "time out" exercises.

        This paper will investigate training for performance in highly demanding environments and how this training can be done to reduce or eliminate the negative effects that intense, stressful environments can have on individuals and their task performance. Mental workload, traditional stress reduction techniques, and the interaction of stress and performance will be studied as well.

Stress and Environmental Intensity

        To understand the best means for preparing individuals to perform in an environment that is intense and demanding, it is important to understand what is meant by stress and environmental intensity.

        Environmental intensity can be measured by the state of the environment or setting in which a variety of factors, such as noise level, temperature and illumination influence a task. However, it is mostly determined by the physical properties (e.g., speed, complexity, etc.) of the given task or of the surrounding situation in which the task will be performed. Environmental intensity can be said to be high, low, or some level in between. Intensity levels that individuals experience, however, are different because certain individuals have either adjusted their minds and bodies to the situation or have developed the necessary skills and abilities to handle the situation. For example, a new accountant experiencing her first tax season at work may be overwhelmed by the intense nature of the work, while someone who has been on the job for a long time may have developed ways to make the work load less demanding. Using a military example, a new recruit may be terrified by gunfire flying over his head; however, a veteran, using his skills and the knowledge that "the bullets can't hurt you unless you stand up," may remain calm.

        When the intense nature of a task or environment causes an alteration of the individual's existing psychological equilibrium, it is assumed that he or she experiences stress. Basically, intensity is determined by the physical properties of the given task and the surrounding situation, while stress is defined as the mental and physical tension that an

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individual experiences in the situation. Stress is the result of individuals' reactions to an environment that is appraised by them as relevant to their own well-being and in which their resources are taxed or exceeded (Folkman & Lazarus, 1985). While environmental demands play a large part in determining the level of perceived stress, mental appraisal of the ability to meet the demands is equally important. Novaco and Vauz (1985) describe this reactive relationship as an imbalance between the demands placed on the individual's system and the available resources needed to counter the demands. These demands can come from external as well as internal sources. External sources include such things as threat to one's person and/or possessions, while internal sources of stress arise from a desire to succeed or do well for other personal reasons (Nelson, Quick, and Quick, 1989). As Selye (1974) stated, "Stress is the spice of life" (p. 83), because it is associated with almost every activity. Thus, it is impossible to completely avoid stress. Responses to stress and intensity can differ across individuals depending on personality and the groups of which they are part.

Personality and Stress

As stated by Welford (1973), "However equal men may be before God and the law, in their reactions to stress they are not the same" (p. 579). What is it that allows certain individuals to handle an intense situation without it affecting their performance? An individual's response to an intense environment can be influenced by many different factors. Personality is one of the factors that has received the most attention from researchers and psychologists. While general consensus has emerged in terms of personality factors (i.e. the "Big Five") the relationship between personality and the specific ways that individuals respond to an intense situation are not as clear. According to Eysenck (1988), the number of personality factors influencing individuals' responses to an intense situation can range from as few as three (extraversion, neuroticism, and psychoticism) to as many as sixteen, because different factor theorists view the same factors from different perspectives.

VanGorder (1987) reported that in combat settings, how a soldier reacts depends on the type of person the individual was before entering the service. The personal innate characteristics brought to the service may be different depending upon various predisposition factors that the individual possesses, including life crises, age, physical health, personal perceptions, and self-control mechanisms. Several key indicators that a soldier may have difficulty in dealing with combat intensity include:

1) Enduring financial or marital and family problems,
2) Spoiled childhood life, dependent on parents and family,
3) Nervous and anxious personality suffering from unrest and uneasiness, and
4) Lack of confidence of ability and experience to perform duties (VanGorder, 1987).

In a study of police officers' job satisfaction, Lester and Solis (1980) found that self-reported stress was a strong indicator of job satisfaction. However, personality factors can lead to differences in the way stress is interpreted by an individual. For example, Duckitt and Broll (1983) found that subjects who are outer-directed or "tough minded" interpret feelings of stress in terms of illness while those that are inner-directed and not as "tough" (personality-wise) interpret the feelings in terms of psychological distress and not as illness. A study by Keinan (1988) showed that trainees' responses to an environmental intensity were related to their confidence expectation on the task in the given situation. Confidence expectation was defined as the likelihood that an individual feels that he or she can perform the task in the situation without being injured. It was found that trainees who had high confidence expectation (those who felt that there was a small chance that they would be injured in that situation) learned best in a high-intensity training environment, while those who had low confidence expectation (those who felt that there

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was a good chance that they would be injured) benefited from training that was presented in a low-intensity environment. Keinan suggests that trainees with high confidence expectation focus on the task at hand rather than the environmental intensity or stressor, while trainees with low confidence expectation focus on the intensity and feel stress.

Trainees' feelings of success or failure also have an effect on their performance of the task (Keinan, 1988; Ryckman & Rodda, 1972). Individuals who had actual or induced feelings of success after training performed better on the criterion task. These studies suggest that trainees should not be exposed to a high-intensity situation if it will create feelings of failure. Because stress is a result of an individual's perceptions and psychological experience of an intense situation, they should be trained to perceive and experience the situation differently. While many personality factors have been discussed in terms of their relationship with stress, few screening procedures have been developed for selecting people who are most likely to succumb to stress (VanGorder, 1987).

Group Factors and Stress

In addition to individual personality factors, group variables (e.g., group morale, cohesion, feelings of belonging to the group, and motivation) can also have a significant influence on the individual's response to an intense situation and his or her job performance. For example, group members' closeness (bonding) has been shown to increase group morale and reduce stress-related casualties (Collins, 1978). Group factors influencing individuals' stress and job performance include conflict among the group members, communication, leadership, cohesion and turnover rate (VanGorder, 1987). A good leader keeps communication channels open between the group members and gives individual members feedback as to their and the group's performance. The social support individuals receive from being part of a group or organization is also beneficial in determining responses to stress. Quick and Quick (1984) advocate a variety of team building, career development, and participative management techniques to organizationally influence individual responses to stress. In an examination of the Vietnam War and stress, Bourne (1970) reports that soldiers' motivation is fostered by allegiance to the group, and within a small group that allows its members to communicate freely, an effective consensus develops as to how an intense event or situation should be perceived; this consensus frequently overrides an individual's normal stress reaction. Bourne's observation suggests that cohesion, the feeling of being part of a group and viewing the group as "we," enables individuals to perform adequately under intense situations without succumbing to stress. The degree of cohesion is determined by the frequency and intensity of interactions between group members. Cohesion is often developed when people are trained together with an understanding that they have a common goal and are "in the same boat" (Ingraham & Manning, 1981).

Stress, Performance, and Health

The importance of preventive stress management is not only to reduce the impact of intense, stressful situations on individual health and well-being, but on task performance as well. The relationship between stress and performance was first investigated by Yerkes-Dodson in the early 1900's. Stress can induce both positive and negative outcomes. The now familiar Yerkes-Dodson Law states that stress increases arousal and arousal influences performance. According to this law, performance at different levels of arousal is like an inverted-U; at low and high levels of arousal, performance is lower than at a moderate level of arousal. Although the moderate level is task-specific and individually different (Kahneman, 1973), people have a tendency to try to maintain their arousal at a moderate level. For example, in a job that involves little or no arousal, the worker often seeks to bring higher levels of arousal into the job by restructuring the task or by allocating the resources differently.

While the term "stress" carries a negative connotation, it is not wholly undesirable for there to be stress present in a performance setting. That is, as the Yerkes-Dodson Law

points out, at certain levels, stress has healthy and beneficial effects on individual well-being and performance. This optimum level of stress is termed "eustress". Contrasted to this are too high or too low levels of stress that result in unhealthy, detrimental responses to stress (Quick and Quick, 1984). Research supports this relationship between stress and performance. Singh, Dwivedi, and Sinha (1979) found that people perform better at a vigilance task under a moderate level of shock than at a low or high level. However, most research has investigated techniques for managing high levels of stress rather than strategies to train people to successfully perform their tasks in intense situations without succumbing to stress.

The negative effects of stress in the workplace can have direct and indirect costs (Quick and Quick, 1984). Direct costs include worker tardiness, absenteeism, turnover, and decreased job performance. Decreased job performance means a reduction in the quality and quantity of output and an increase in the number of accidents and injuries occurring in the workplace. Workers' poor attention and poor decision-making are the most often cited reasons for the decrease in job performance. Indirect costs include workers' low morale and motivation, and poor communication between management and the workers. Resentment and distrust between workers and management are often observed in a stressful environment (Quick and Quick, 1984).

Stress can not only negatively effect performance and social factors, it also has an impact on the health of individuals. As stated in Nelson, et. al. (1989), "The danger of the stress response lies in the potential for managing it poorly. Like machines, the human body suffers wear and tear and can become worn out" (p. 71). Stress can cause various physical symptoms, such as muscular tension, headaches, sweating, shaking, nausea, loss of appetite or overeating, hyperventilation, sleep disturbances, depression, irritability, and back-pain (Buckalew, 1990; Solomon, Mikuliner, Benbenishty, 1989; Cohen, 1978). According to Bieliauskas (1982), stress can cause more serious physical problems such as heart disease, cancer and immune-related illnesses. It is for this variety of possible outcomes, that the means for handling how humans react to and perform in stressful situations has been studied. Because of the effects stress and intensity can have on health and performance, methods for preparing individuals for exposure to these environments have been studied and used.

Methods for Altering Responses to Stress

Stress Management Training. Most of the methods for dealing with stress center around controlling the number of stressors or minimizing organizational costs and discomfort to the individual (Quick and Quick, 1984). These alterations are made through task redesign, goal setting, team building, participative management, and psychiatric care. Other methods for dealing with stress include deep relaxation, meditation, hypnosis, and interpersonal skills training (Girdano, Everly, and Dusek, 1990; Albrecht, 1979).

Business communities have addressed the problem of stress and developed various types of "wellness" programs that help in the reduction of stress's effects on productivity and employee health (Standke, 1979). However, most of these programs deal with stress "after-the-fact," so that individuals are treated after facing intense situations and after the effects of stress have begun (Quick and Quick, 1984; Eysenck, 1988). In the military, a series of workshops was given to train doctors for the treatment of combat-induced "stress casualties." Many of these stress management techniques are very useful but should be selectively applied. For example, a post-combat stress management effort treated the stress casualties that resulted from being in an intense combat situation for a long time, but it would be better if soldiers were trained to deal with the combat stress in advance and the stress casualties did not occur. This points to a need for methods for training soldiers to perform in demanding, intense combat situations.

In a preventive stress management system described by Nelson, et. al. (1989), the most useful set of strategies for avoiding the negative aspects of stress are the primary

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strategies that seek to reduce or alter in some way, as to make them manageable internal and external stressors. It makes sense to want to avoid having to treat the symptoms of exposure to stress and intense settings using secondary prevention strategies.

The difficulty with the primary stress prevention strategies suggested by Nelson, et. al. (1989), is if the task can't be redesigned, expectations changed, or the stressor reduced, we are left with dealing with persons' responses to the stress (secondary strategies) and at worse, treating those who have succumbed to the stressful, intense environment (tertiary strategies).

Most traditional forms of stress reduction do not work in intense settings as they do in less intense environments, because they have been developed to deal with stress associated with different factors such as frustration, being in a rut, overcrowding, discrimination, bureaucracy, and socioeconomic variables (Girdano, Everly, and Dusek, 1990). A relaxation or task redesign technique is of no use for a task that is very intense and cannot be restructured. Thus, a different method of primary prevention strategies needs to be studied to deal with stress occurring in an intense situation like combat. These techniques would be based on an inability to alter the stressor or redesign the task, and the need to prepare individuals prior to entering the stressful, intense environment. In an intense setting such as combat, failure to perform at some standard can result in injury or loss of life. Since the environmental intensity can be objectively controlled, it can be incorporated into training in various ways that allow trainees to experience the task demands and develop skills and abilities necessary for successfully coping with the intense situation.

Training of Task Performance and Stress Coping Skills. Soldiers, as a group and as individual task performers, should be ready for the intense situations that they may experience in the future (Weaver & Stewart, 1988). Collins (1978) suggests that training is an essential tool for building military cohesion and bringing about effective task performance. Because individuals' perceptions of and experience in an intense situation are different, each individual should develop the appropriate skills and abilities required to perform the task and handle the intense situation. If they have the necessary skills and abilities, a situation that for many may be quite intense and as a result, stressful, can be handled without deficits in performance and without stress related after-effects. The training can involve a variety of methods, strategies, and techniques, including the means and procedures for getting help, using labor saving devices, allocating attention, applying basic performance knowledge and skills, and practice and training in realistic settings. Training in realistic settings seems to be particularly important for developing applicable skills and for preparing for the intensity that will be faced in the actual task performance (Gagne, 1962). According to Friedland and Keinan (1992), realistic-setting training requires two conditions: 1) familiarity with the intensity to be encountered in the actual task performance, and 2) possession of basic skills and knowledge required to perform the task.

Buckalew (1990) states that the "physiological responses" the body exposed to stress will make "can be manipulated or modified by training and experience" (p. 4). To enable soldiers to bear the load of stress, Buckalew suggests training them with the anticipated load and conditioning them to the stressors in similar situations. Ideally, "if a stressor is expected and the soldier has been repeatedly exposed to it under realistic conditions... motivation should be increased, and load bearing should suffer but minimal degradation in actual combat" (p. 20). George (1967) also argues that if the goal of training is to have soldiers coordinate in combat, they must be trained in conditions similar to those of combat.

The individual's knowledge and skills necessary for performing the task are directly related to his or her perception about the intensity in the situation and his stress level related to the task. For example, in a situation such as fighting against a large number of enemy tanks, the soldier's possession of the necessary tactical and strategic tank

fighting skills can reduce his stress level in the situation. What is stressful for one person may not be for another. However, as previously discussed, trainees need not only the knowledge and skills necessary for performing the task, but also the experience with the same levels of intensity that will be in the actual task performance. A question to be answered is what is the optimal way to train individuals for the acquisition of the necessary skills and the situational intensity experience.

Dyer (1986) reports that the learning principle, "learning by doing," can be applied to the training of both task and stress-coping skills. For its application to military training, he restated the principle as "learning by doing in a combat-like environment" (p. 32). However, Dyer's recommendation does not suggest how this principle should be applied.

Intensity Level and Training. The way in which an individual is trained directly influences how much information is learned and how well the individual will apply the knowledge and skills to a new environment. The expected situational intensity in the real task performance can be manipulated in various ways for presentation during training. Some researchers and trainers say that presentation of the same intensity level as in the actual task performance situation throughout training allows trainees to develop a "toughness" and enables them to better handle the stress in the actual situation (Dienstbier, 1989). Although this training method is widely used (Barrett, 1994; Sherer, 1993; Eikenberry, 1993), it has been shown not to be the most beneficial means of training. When the criterion-level of intensity is presented throughout training, it can create anxiety for the trainees and hinder the acquisition of the necessary skills. Anxiety is a great contributer to inefficient work by interfering with effective observation, analysis, recall, and planning (Sullivan, 1948). On the other hand, training with no stress (no exposure to the expected intensity) does not adequately acquaint trainees with what they will have to experience in terms of stress and intensity (Friedland and Keinan, 1992). What is needed are methods of training that allow trainees to learn the knowledge and skills necessary for the task performance and become familiar with the intensity that will be present in the actual environment.

Intensity and Mental Workload. As reviewed above, research has shown that either training with the performance-level intensity throughout training or training without exposure to the performance-level intensity is not the best way for preparing trainees to develop the skills and abilities necessary to perform the task. These training approaches can induce stress, decrease confidence and motivation, or can result in an increase in boredom or fatigue. For example, with no intensity training, trainees may be able to learn basic skills necessary for the task performance, but they will not be prepared for the time pressures and the demands that they will have to work against during the performance. The time restrictions can lead to stress for individuals who are not prepared for it, and, as the time constraints becomes more important, the task will be perceived as being more difficult (Moray, 1982). If task performance skills are easy to learn and the task provides little or no intensity, trainees may become bored and attempt to use their spare mental capacity in ways that are not desirable for training. With no-intensity training, they can easily learn the task performance skills but demands and time constraints in the actual task setting can result in poor performance.

In contrast, presenting performance-level intensity throughout training may overload the trainee to the point that they are unable to divide their attention between learning the necessary skills and reacting to the intensity and time pressures. This type of training often results in poor acquisition of knowledge and skills. It also reduces trainees' confidence and motivation to work on the task, and results in poor performance on the actual task (Moray, 1982). It has also been shown that trainees who, while training, feel that they are far away from meeting their goal, experience an increase in mental workload (Hancock and Caird, 1993). This, coupled with the time pressures, can lead to an overload of the trainee's mental capacity.

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Mental Overload and Performance. As tasks become more complex and increasingly dependent on mental functions, the relationship between mental workload and performance becomes more important (Wierwille, Rahimi, and Casali, 1985). Although mental workload is not a clearly defined construct, it is considered a multidimensional concept that is determined in most part by the nature of the task and worker characteristics (Hancock and Caird, 1993). Mental work has been described as "any work done by an individual primarily using perceptual and cognitive abilities, especially those involving such activities as calculating, reasoning, monitoring, decision-making, and verbal/image processing" (p. 202, Stramler, 1993). Mental workload has been related to the amount of this cognitive work that is taking place. Mental workload in and of itself is not negative. When individuals do not have necessary mental resources available to meet the task demands however, their mental capacity is overloaded and they experience cognitive difficulty or failure in task performance (Hancock, 1989).

Early studies of cognitive processes, including attention, suggest that human mental capacity is limited. Attention research began with the investigation of where the selection stage of attention occurs in the cognitive process. The most influential studies searching for this "bottleneck" include Broadbent's Filter Theory (1958), Treisman's Attenuation Model (1960), and Deutsch and Deutsch-Norman Memory Selection Models (1963, 1968). Each of these theories located the point of attention selection in a different place. The difficulty in determining where the bottleneck occurred has led researchers to study the capacity demands of the task and the amount of mental resources necessary to meet the demands. Kahneman's Capacity Model (1973) discusses the general limits on a person's capacity to process information (Reed, 1988). The capacity model states that mental capacity is limited and when the task demands exceed the capacity, task performance declines. Such performance decline may not only lead to reduced productivity, but can even be life-threatening (Paas and Merrienboer, 1993). In human-computer interaction studies, a mismatch between task demands and worker mental resources has been shown to lead to stress (Hockey, Briner, Tattersall, and Wiethoff, 1989). Thus, mental workload should be carefully considered in training. For some tasks, it is possible that different training procedures may not yield different levels of performance, but the mental workload associated with the different training procedures may be vastly different (Paas and Merrienboer, 1993).

Task and Situation Intensity in Training. When preparing training programs, it is important to understand the mental requirements of the task. The mental workload an individual experiences during training influences his or her knowledge and skill acquisition during the training and, consequently, actual task performance. Training only basic skills and procedures required to perform a task, without exposure to the task and situational intensity to be experienced on the actual task performance, may lower trainees' motivation due to the lack of reasonable mental or physical challenges. As discussed, some stress or intensity (eustress) may be useful to keep motivation and performance levels up (Kahneman, 1973; Quick and Quick, 1984). Even if it does not lower their motivation, the trainees will not be adequately prepared for the workload to be encountered during the actual task performance. However, training with the same task and situational intensity to be experienced in the actual task performance from the beginning may overload trainees' mental capacity, reduce their confidence, and lead to failure of training. Once an individual's mental capacity is overloaded, adding any additional information or task requirements increases his or her perceptions of complexity and difficulty of the task (Kantowitz & Sorkin, 1983). Thus, it is important to adjust the task and situational intensity to be presented during training to maximize the effects of training, without causing mental overload, while providing reasonable challenges for mental stimulation.

Primary Prevention Strategies for Performance in Intense Settings

These strategies are based on training individuals to perform a task that, because of its nature, can't be redesigned nor have its stressors and intensity reduced. Friedland and Keinan (1992) have studied two training types that may be useful for the presentation of the task and situational intensity during training: (a) phased-intensity training, and (b) graduated-intensity training.

Phased-Intensity Training. Thompson (1989) recommends that it is best if stressful, intense conditions are introduced gradually once the basic skills have been practiced and learned. However, this recommendation is not often followed. Keinan, Friedland, and Sarig-Naor (1990) studied the extent that soldiers need to experience combat stressors (i.e., task and situational intensity) in training. They developed two "phased training" methods that allow trainees to be exposed to the task/situational intensity or stressors through different phases of training. In the first method, trainees go through the following phases: (a) practice the task performance skills without exposing to the stressors, (b) experience the stressor without practicing the skills, and (c) practice the skills with the stressor present. In the second phased method, training is presented through only phases (a) and (c).

Keinan, et. al. (1990) compared the effects of these two methods of phased training with those of high-intensity and no-intensity training. In the high-intensity training, trainees were constantly exposed to the actual task/situational intensity while learning knowledge and skills required to perform the task throughout training. In the no-intensity training, trainees learned the knowledge and skills without exposure to the actual task/situational intensity. The results showed that both of the phased training methods were more effective than either the high- or no-intensity training. The second method of phased training was shown to be better than the first phased method. These findings suggest that training should be presented in two phases: first, without the actual task/situational intensity; and then, with the actual task/situational intensity present. Exposure to the task intensity alone, without the performance practice, does not seem to be beneficial, except for making trainees aware of the level and type of intensity that they will have to face later in training.

Graduated-Intensity Training. Friedland and Keinan (1982, 1992) tested another method for the presentation of task/situational intensity during training, based on a stress inoculation procedure designed to teach stress-coping skills (Orne, 1965; Meichenbaum, 1985). This method creates a training environment in which the presentation of the task intensity increases gradually from a mild level at the beginning of training to the level to be experienced in the actual task performance situation at its conclusion. This gradual increase in training intensity has a correlate in psychiatric therapy. Sullivan (1948) stated that, "Anxiety as a functionallly effective element in interpersonal relations has to be mild in degree or gradual in its increasing severity" (p. 10). While written for use in interpersonal skill development, this statement has uses for other situations in which preparation for events in which anxiety and stress may be likely. This gradual presentation method is different from phased methods that present training with no intensity in the beginning phase and present full-intensity in a latter phase of the training. The authors argue that graduated-intensity training reduces trainees' anxiety and bolsters their confidence in coping with the actual task/situational intensity.

In military training, Dougherty (1993) argued that soldiers should experience realistic combat situations during training. However, Dougherty said that the first part of training does not have to be under full combat conditions (high intensity) and should follow the "talk, walk, and run" sequence of training. This type of gradual training ends with a high-fidelity, live-fire rehearsal. Goethals (1993) also said that combat training would well be served if it would follow a gradual training format that introduces high-intensity training later in training.

Friedland and Keinan (1982, 1992) tested the effect of graduated-intensity training against that of a high-intensity training, no-intensity training, and a phased-intensity training. The phased-intensity training was the same as the no-intensity training in the early phase of the training and the same as the high-intensity training in the later phase. The results showed that phased-intensity training was more effective than the other three training types.

According to Friedland and Keinan, the phased-intensity training provided the opportunity to learn the basic skills required to perform the task, in the beginning phase of training without stress, and the opportunity to practice the skills in a highly demanding, intense situation in the later phase. Friedland and Keinan (1992) argue that phased-intensity training is well suited for military training because many military tasks require the acquisition of complex skills and creating a training environment using a gradations of intensity can be difficult. However, recent computer technology provides an opportunity to develop sophisticated simulators that can control the presentation of the task/situational intensity as needed for the given training situation. Virtual reality might also hold promise as a means for exposing individuals to stressful, demanding environments in order to prepare them for performance in one similar to it. Research has shown that fear of heights was treatable by exposure to virtual reality environments (Rothbaum, Hodges, Kooper, and Opdyke, 1995). Various methods and techniques (Park, In Press) can be used to adaptively present the task/situational intensity to individual trainee's needs through simulators. In addition to the functional flexibility for presenting training tasks and scenarios, simulator-based training has a number of advantages. Combat training simulators have been increasingly used to reduce training costs (e.g., cost for operating actual equipment for training), increase training effectiveness and efficiency, protect the training environment, and increase trainee safety (Sommer, 1989; Combined Arms Battle Logistics Simulation, 1992). Particularly, a simulator's ability to keep records on trainee and simulator interactions, including trainee actions, mistakes, and achievements, can be very useful. This information can be used for instructional decisions in the later stages of training, providing opportunities for implementation of various types of training methods and strategies, including the presentation of task/situational intensity. Since simulators can allow trainees to be exposed to possible life-threatening intensity without risk, they can be ideal tools for training the skills necessary to cope with highly stressful task/situational intensity.

While there can be a variety of ways to "phase-in" or "gradually" present training for performance in demanding, intense environments, what stands out about these types of training presentation is the need for basic skill practice as well as practice with the expected performance level intensity.

Conclusions

The goal of preventive stress management is to start intervention in the early stages before stress and intensity can take a negative toll on the individual and his/her performance. What is missing from these stress management techniques is a means for dealing with stressful situations in which the stressor can't be reduced, either through task redesign or changed expectations. Because of this, we are in many instances, left with using "after-the-fact" techniques for the treatment of stress casualties. Research findings indicate that reduction of the impact of stressful events leads to better worker morale, health, and performance; thus, it is important to study methods and strategies for successfully dealing with stress and reducing its negative effects. While many programs are available and being developed that can help treat stress casualties "after-the-fact", it should be preferred to train persons in such a way that the intense nature of a setting will not negatively influence their performance and that they will not need treatment afterwards. This can translate to a savings of time and money as well as help maintain worker/soldier morale.

Many studies have been conducted to investigate methods and strategies for training individuals to perform a task in intense, potentially stressful settings. The findings suggest that people can be best prepared for performing a task in an intense setting when they experience the type of intensity to be encountered in an actual task situation during training. These studies also suggest that special attention must be given to teaching the knowledge and skills required for task performance during the training, because exposure to too intense of an environment too early during training can result in poor acquisition of the knowledge and skills. A graduated or phased-in presentation of the actual task/situational intensity seems to be most beneficial for transfer of training to an intense task environment. Through these types of training, trainees will be able to acquire the necessary knowledge and skills, while experiencing the actual task/situational intensity, before performing in the task setting.

An important point to address with respect to these types of training is generalizability from training to transfer environment and from performance environment to performance environment. At the center of stress management strategies is the issue of transfer of stress response training to the workplace (i.e., "real-world") settings (Sharpley, 1994). For example, in Sharpley's (1994) study of heart rate reactivity contol (HRRC) training, it was found that subjects were able to maintain HRRC for at least 4 months and were able to transfer it to incidents occuring outside of the lab. For this stress management technique it appears that once trained, individuals were positively able to influence their responses to stress in a variety of situations that required HRRC. This, however, may not always be the case with stress managment procedures and research is necessary to study the transfer of stress response skills. It may be that generalization is dependent on the type of stressor or intensity present since the task and the intensity of the task can be so interrelated. As stated by Sharpley (1994), for those stress management techniques that have clear supportive data, there is little use in continuing research with them without assessing their generalizability to everyday life.

The effects of the phased- and graduated-intensity training have been investigated mostly in artificial environments. For example, stress was induced by placing the subject's hand in a bucket of ice water. Further research on these training methods is necessary before drawing conclusions about their effects and generalizability. All that can be said to this point is that training for performance in intense, potentially stressful environments, seems to be most effective when trainees are given sufficient practice time with the basic skills of the task, and exposure to the performance environment intensity at a later point in training. The previous research does, however, offer a direction for future research. Also, since objectively controlling levels of intensity and stress presentation are important in either phased- or graduated-intensity training, computer technology, particularly simulators, would provide a means for manipulating the task and situational intensity in a variety of ways during the training. Thus, research is recommended in the area of adaptive presentation of task/situational intensity based on the individual's perceived stress level and their task performance, using computer-controlled simulation.

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